REMARKS

Applicants appreciate the detailed examination evidenced by the Office Action mailed November 16, 2007 ("Office Action"). Applicants have amended Claim 3 to correct a potential antecedent basis error and have amended the title as requested. Applicants respectfully request reconsideration and withdrawal of the rejections of Claims 1-27 for at least the reasons discussed below.

Independent Claims 1 and 3 are patentable

Independent Claims 1 and 3 stand rejected as allegedly anticipated by U.S. Patent No. 5,498,950 to Ouwerkerk ("Ouwerkerk"). Office Action, p. 2. Claim 1 recites:

> A battery management system for managing a string of cells including a sensing module; a DC/DC converter; a control module coupled to the sensing module and the DC/DC converter; and a common line coupled to both the sensing module and the DC/DC converter and adapted for connection to a battery when in use, wherein the sensing module is configured to receive battery information from the common line and output a sensing signal to the control module in accordance with the battery information, wherein the control module is configured to receive the sensing signal from the sensing module and output a control signal in accordance with the battery information, and wherein the DC/DC converter has a first port configured to be coupled across a plurality of cells of the string and a second port coupled to the common line, the DC/DC converter operative to transfer energy between the first and second ports to feed and/or drain a battery connected to the common line when in use in accordance with the control signal.

Ouwerkerk provides no teaching or suggestion of several of the recitations of independent Claim 1.

The Office Action alleges that the "independent controller" described at col. 3, line 24 of Ouwerkerk corresponds to the recited DC/DC converter. Office Action, p. 2. Ouwerkerk indicates that the controller couples the battery pack 13 to the power source 30, but is silent at to what this independent controller is and does not imply that it is a DC/DC converter. Indeed, as Ouwerkerk pertains to electric vehicles, this independent controller could be a circuit for charging the battery pack from an AC mains power source, e.g., the independent controller could be an AC/DC converter that transforms the AC power from the power source to the required DC voltage to charge the battery.

Even if the independent controller were a DC/DC converter (which Applicants deny), there is no teaching or suggestion that the independent controller is coupled to a control module as recited in Claim 1. As described in Ouwerkerk, it appears that the independent controller is merely an interface between the battery pack and its associated power source.

Ouwerkerk also fails to disclose or suggest that this "independent controller" is coupled to a common line to which a sensing module is also connected. Again, as described in Ouwerkerk, it appears that the independent controller is merely an interface between the battery pack 13 and its associated power source 30.

Furthermore, the independent controller described in Ouwerkerk does not appear to have "a first port configured to be coupled across a plurality of cells of the string and a second port coupled to the common line" and does not appear to be "operative to transfer energy between the first and second ports to feed and/or drain a battery connected to the common line when in use in accordance with the control signal." In fact, as described in Ouwerkerk, the independent controller merely couples the power source to the battery pack and does not appear to utilize any control signals from either of the sensing modules 22, 25.

Accordingly, Ouwerkerk fails to disclose or suggest several of the recitations of Claim 1. For at least these reasons, Applicants submit that Claim 1 is patentable. At least similar reasons support the patentability of Claim 3 over Ouwerkerk.

Independent Claim 8 is patentable

Independent Claim 8 also stands rejected as allegedly anticipated by Ouwerkerk. Office Action, p. 2. Independent Claim 8 recites:

> A battery management apparatus for managing a substring of cells in a string of cells, the apparatus comprising:
> a DC bus;
> a multiplexer/demultiplexer circuit operative to selectively couple nodes of the substring of cells to the DC bus;
> a DC/DC converter circuit having a first port configured to be coupled across a plurality of cells of the string and a second port coupled to the DC bus, the DC/DC converter operative to transfer energy between the first and second ports;
> a sensor circuit coupled to the DC bus; and
> a controller circuit configured to connect to a communications bus and operatively associated with the multiplexer/demultiplexer circuit, the DC/DC converter and the sensor circuit.

The Office Action asserts that the charging lines 31 of Fig. 2 of Ouwerkerk correspond to the "DC bus" recited in Claim 8, and that the decoder and driver circuit 18 shown in Fig. 2 of Ouwerkerk correspond to the "multiplexer/demultiplexer circuit" recited in Claim 8. Office Action, p. 2. However, Applicants note there is no teaching or suggestion in Ouwerkerk that the decoder and driver circuit 18 is "operative to selectively couple nodes of the substring of cells to the DC bus." Rather, the decoder and driver circuit 18 operates a set of switches 21 to apply current from an isolated current source 24 to a selected individual battery 12 in the battery pack 13. The decoder and driver circuit 18 does not couple any of the individual battery nodes to the charging lines 31.

For reasons along the lines discussed above with reference to independent Claims 1 and 3, Ouwerkerk also fails to disclose or suggest "a DC/DC converter circuit having a first port configured to be coupled across a plurality of cells of the string and a second port coupled to the DC bus, the DC/DC converter operative to transfer energy between the first and second ports" as recited in Claim 8. In particular, as discussed above, Ouwerkerk does not teach a DC/DC converter at all, much less one with ports connected in the manner recited in independent Claim 8.

Ouwerkerk also fails to disclose or suggest " a controller circuit configured to connect to a communications bus and operatively associated with the multiplexer/demultiplexer circuit, the DC/DC converter and the sensor circuit." The Office Action asserts that the DC/DC converter is the "independent controller" coupling the power source to the battery pack (Office Action, p. 2), but Ouwerkerk contains no teaching or suggestion that the independent controller is operatively associated with the controller 14. Indeed, it appears that the purpose of the independent controller is merely to provide a coupling arrangement between the power source 30 and the battery pack 13, and this part of the system is not controlled in any way by the charge controller 14. Instead, it appears that the charge controller 14 is used to modify the charge within each battery cell by selectively charging the individual battery cells using the isolated current source 24. *See, e.g.*, Ouwerkerk, column 5, lines 51-59.

Accordingly, Applicants submit that Ouwerkerk fails to disclose or suggest several of the recitations of independent Claim 8. For at least these reasons, Applicants submit that independent Claim 8 is patentable.

The dependent claims are patentable

Applicants submit that dependent Claims 2, 4-7 and 9-27 are patentable at least by virtue of the patentability of the respective ones of independent Claims 1, 3 and 8 from which they depend. Applicants further submit that several of the dependent claims are separately patentable.

For example, Claim 11, which stands rejected as allegedly anticipated by Ouwerkerk (Office Action, p. 2), recites "wherein the DC/DC converter circuit further comprises a third port and is operative to transfer energy between the first and third ports, and wherein at least one of the controller circuit, the multiplexer/demultiplexer circuit and the sensor circuit are configured to be powered from the third port." The Office Action fails to provide any indication as to where Ouwerkerk teaches or suggests such recitations, and Applicants submit that Ouwerkerk is devoid of such teachings. For at least these reasons, Applicants submit that Claim 11 is separately patentable.

Claim 12, which also stands rejected as allegedly anticipated by Ouwerkerk (Office Action, p. 2) recites "wherein the DC/DC converter circuit further comprises a fourth port configured to be coupled to a power supply bus associated with the communications bus and is operative to transfer energy between the fourth port and the third port to power to at least one of the controller circuit, the multiplexer/demultiplexer circuit and the sensor circuit." As with Claim 11, the Office Action fails to provide any indication as to where Ouwerkerk teaches or suggests such recitations, and Applicants submit that Ouwerkerk is devoid of such teachings. For at least these reasons, Applicants submit that Claim 12 is separately patentable.

Claim 13, which also stands rejected as allegedly anticipated by Ouwerkerk (Office Action, pp. 2 and 3), recites "wherein the controller circuit is operative to cause the multiplexer/demultiplexer circuit to couple the DC bus and the ground bus to respective selected first and second nodes of the substring of cells, to cause the sensor circuit to sense a voltage between the DC bus and the ground bus and to cause the DC/DC converter circuit to transfer energy between the selected first and second nodes and the plurality of cells of the strings responsive to the sensed voltage." As discussed above, Ouwerkerk describes selectively transferring energy to nodes of a selected battery 12 using a current source 24, not transferring energy between the plurality of cells of a string and selected nodes of the strings.

Accordingly, Ouwerkerk does not disclose or suggest the recitations of Claim 13 and, for at least these reasons, Applicants submit that Claim 13 is separately patentable. At least similar reasons support the separate patentability of Claim 15.

Claim 25, which stands rejected as allegedly anticipated by Ouwerkerk (Office Action, p. 2), recites "[a] plurality of battery management apparatus according to Claim 8, respective ones of which are connected to respective substrings of the string of serially-connected cells, wherein the controller circuits of the plurality of battery management apparatus are coupled to the same communications bus." The Office Action provides no indication as to where Ouwerkerk teaches or suggests such recitations, and Applicants submit that Ouwerkerk is devoid of such teachings. For at least these reasons, Applicants submit that Claim 25 is separately patentable.

Conclusion

As all of the claims are now in condition for allowance, Applicants respectfully request allowance of the claims and passing of the application to issue in due course. Applicants urge the Examiner to contact Applicants' undersigned representative at (919) 854-1400 to resolve any remaining formal issues.

Respectfully submitted,

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CERTIFICATION OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on March 26, 2008.

Candi L. Riggs